A Controlled Evaluation of a Community Injury Prevention Project in Two Greek Islands

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Injuries are responsible for reduction of life expectancy to an extent comparable to more common fatal diseases, notably cancer and cardiovascular diseases.1 This is because the latter diseases preferentially affect older age groups, whereas injuries represent a major problem throughout life and they peak in late adolescence and early adulthood. The phenomenon is particularly striking in Greece because the overall incidence of or mortality from cardiovascular diseases is low compared to other European countries, whereas mortality from injuries, particularly among the young, is among the highest in Europe.2 The notion that primary prevention is better than any other control policy has been more readily accepted with respect to injuries than for other major killer diseases, such as cancer and cardiovascular diseases, since the aetiology of injuries is more clearly of an exogenous nature. The potential for primary prevention has been demonstrated through ecological contrasts, since in the Scandinavian countries and the UK the burden of mortality from injuries is substantially lower than in southern European or in developing countries.2 Moreover, it has been gradually recognized that prevention of injuries, particularly among children, is more easily accomplished through, so called, passive protection, namely measures which do not require active involvement or even awareness and knowledge on the part of the protected individuals.3–5 More controversial is whether health...
education-centered programmes are reasonably effective and economically efficient. Over the last 20 years several controlled intervention programmes have been evaluated with results ranging from modestly encouraging to disappointing.

We have implemented a health education-based injury prevention intervention programme on the island of Naxos; furthermore, we have compared the results with those from the island of Spetses where there was no such intervention over the same time period. Although reliable economic statistics at the municipality level are not available in Greece, the two islands are considered equally prosperous and they have similar demographic profiles. Given that consumer products are involved in the majority of home injuries sustained by children and adults, special emphasis was given to home injury prevention.

METHODS
The General Intervention
The multifaceted intervention was done in the town of Naxos on the homonymous island (population 14,465 inhabitants), whereas the town of Spetses on the homonymous island (population 3,802 inhabitants) was used for comparison. The whole project lasted 20 months from September 1993 to April 1995. In the town of Naxos 18 open meetings were held. The meetings were organized by six members of the Center for Research and Prevention of Injuries among the Young (CEREPRI) and were attended at least once and usually more frequently by the Mayor and several members of the town council, most of the health professionals on the island, local journalists and radio reporters, church representatives, traffic police officials, most teachers from the primary and secondary schools, leaders of the Women’s League and many of the town residents; they all comprised thereafter a safety alliance. In the context of the programme the CEREPRI team also undertook several specific actions in collaboration with the local authorities including:

- seminars for parents extensively advertised and widely attended
- workshops with teachers targeting safety improvements in the school environment and injury prevention at schools
- interactive courses with primary and secondary education students concerning injury prevention and basic cardio-pulmonary resuscitation techniques
- school visits and removal from playgrounds and school yards of dangerous materials

These activities took place over the initial 4-month period, December 1993 to March 1994. No similar activities were undertaken in the town of Spetses.

The Focused Intense Intervention
An effort was made to randomly select 200 households in each of the two participating towns from among those that included either children and adolescents (≤18 years old) or elderly (≥65 years old). In Naxos 187 such households were identified but 15 refused to participate; in Spetses 192 such households were identified and another 15 refused to participate. In Table 1, the distribution of the studied household members by town and age group is shown. Within the major age groups, the age and gender distributions of the household members in the two towns were very similar. The number of households in the participating towns was such as to generate between 300 and 350 young and elderly people in each town. If the baseline cumulative incidence of injuries of any severity in the study period was 30% (an estimate derived from a pilot survey in the study population) the study would have around 85% power to demonstrate a reduction in the incidence by one-third at a 0.05 one-tail level of significance.

On the island of Naxos four local women were specifically trained by the CEREPRI team in home injury prevention; they were hired as research assistants in the project and were asked to visit weekly every household participating in the focused, intense intervention. Their duties involved discussion on injury prevention and on specific home safety issues with the household members with emphasis on the young and the elderly; and, assessment at their first visit as well as at the end of the study period of 10 home safety variables, eight variables concerning first aid kit items and

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<th>Age group</th>
<th>Naxos</th>
<th>Spetses</th>
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<tr>
<td>0–18 years</td>
<td>287</td>
<td>242</td>
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<tr>
<td>19–64 years</td>
<td>306</td>
<td>331</td>
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<tr>
<td>65+ years</td>
<td>43</td>
<td>57</td>
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<td>Total</td>
<td>636</td>
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10 variables probing knowledge and attitudes with respect to safety. The home safety variables referred to the availability of: a device for automatic electricity cutoff; functional fire extinguisher; slip resistant bathroom rug; first aid kit; flashlight; adequate corridor illumination; safe heating equipment; properly designed indoor stairs; properly designed outdoor stairs; and safe balconies. First aid kit variables referred to the availability of the following items: antiseptic solution, cotton pads, hydrogen hyperoxide, injectable hydrocortisone, bandages, thermometer, alcohol and syrup of ipecac. The safety, knowledge and attitudes indices on the part of the housewife referred to: readily accessible telephone numbers for the local Health Centre and the National Poisons Centre; consideration of an evacuation plan; adherence to the warnings in pesticide preparations; safe storage of pesticides and cleaning equipment; safe storage of farming equipment, encouragement of seat belt use; encouragement of helmet use; avoidance of bedside smoking; and avoidance of electric water heaters while bathing. These 28 variables were mainly abstracted and properly modified from a brochure prepared by the Massachusetts Department of Public Health. The research assistants were also asked to help each housewife keep a diary of any injury to household members during the study period that required attention by a health professional (physician, nurse or local pharmacist) or caused discomfort that lasted more than 2 hours.

On the island of Spetses four local women were asked to assess home safety at the beginning and at the end of the study period and to help the housewives keep a diary of injuries as was done on Naxos. However, these research assistants had no specific training in injury prevention and had not been exposed to the systematic campaign for injury prevention implemented on Naxos. Moreover, they were not discouraged or encouraged to discuss safety issues with the participating housewives or their household members.

Monitoring of injuries lasted from 1 January to 15 May and from 1 September to 31 December 1994, i.e. for 255 days. Between 16 May and 31 August 1994, the summer holiday period disrupts the lifestyle of the inhabitants of Naxos and Spetses and considerably inflates the population of the islands, making it difficult to implement reliable monitoring of injuries. It was also not possible to evaluate the effectiveness of intervention on the basis of hospital admissions and health care contacts, since these refer to serious injuries which are relatively rare and do not reach statistically reliable numbers during the relatively short period of follow-up. Moreover, several physicians have private practice for irregular time periods on the island and their record-keeping does not meet the standard required for a research project.

RESULTS
On both islands home safety, first aid kit, and safety knowledge and attitude variables were assessed at the beginning and at the end of the project period by the local research assistants. In the individual process variables assessing home safety, an average of 63% in the Naxos sample and an average of 58% in the Spetses sample were judged as adequate before intervention; regarding first aid kit components, the respective average proportions were 73% and 75% respectively; and with regard to safety attitude variables the respective average proportions were 66% and 65% respectively. All three between-island differences are far from significant ($P = 0.75, 0.95$ and 0.96 respectively). All changes, whether improvements or deteriorations were statistically evaluated through the $\chi^2$ test for paired observations. On the island of Spetses there was statistically significant improvement for just one variable (slip resistant rugs), whereas on the island of Naxos there were statistically significant improvements for 11 variables, most of which could be easily and cheaply implemented (automatic electricity cutoff, flashlight, better lighting in corridors and availability of first aid kits containing absorbent cotton pads, injectable hydrocortisone and alcohol; knowledge and attitudes with respect to evacuation plan, bedside smoking and telephone access to the local Health Centre and the National Poisons Centre). No significant improvements were noted in terms of structural or expensive changes, e.g. modification of safety features of indoor or outdoor stairs and balconies. Statistical evaluation through $\chi^2$ testing for two independent samples concerning differences between locations in the proportion and improvements generated similar overall results (statistically significant differences were also noted for availability of hydrogen hyperoxide, bandages, thermometers and adherence to the warnings on pesticide preparations).

Over the study period 175 accidents were recorded in Naxos and 178 in Spetses. Table 2 shows the distribution of these accidents by mechanism, type of injury and nature of health care contact. There are no striking differences in the distributions between the two islands with respect to mechanism, except that motor vehicle collisions were substantially more frequent on Spetses ($P \sim 0.002$). With respect to the type of injuries, concussion and related injuries were more frequently recorded on Naxos ($P \sim 0.008$), whereas open wound injuries were more common on Spetses ($P \sim 0.001$).
Given the multiplicity of comparisons and the absence of an obvious explanation, these apparent differences cannot be satisfactorily explained. Relatively more injured people contacted the local Health Centre on Naxos than on Spetses, whereas the opposite is true with respect to contact of private physicians ($P$ for difference in the overall distribution 0.001).

Table 3 shows the distribution of recorded injuries by gender and age of affected individuals and place of injury. The distributions in the two islands do not differ in a striking or statistically significant way, except again with respect to motor vehicle injuries ($P = 0.02$).

Table 4 shows incidence rates per $10^5$ person-days for total accidents among target and non-target age groups on the two islands as well as associated confidence intervals (CI) and $P$-values. Since there was an explicit hypothesis stating that the intervention should have a beneficial, if any, impact, $P$-values are legitimately one-sided and 90% CI can be legitimately used. Statistical testing was done by the Oleinick and Mantel procedure.$^{11}$ It appears that in the target age groups (0–18 years and $\geq 65$ years) the incidence rate in the intervention group is about 15% lower although the difference is not statistically significant (one-sided $P = 0.10$). No such indication is evident among adults (19–64 years).

Table 5 gives data on home accidents only, because these accidents were the main focus of our efforts in the samples of households on the two islands. In the target age groups a reduction of 21% is noted, which again is not statistically significant (one-sided $P = 0.09$).

In this design the pre-intervention incidence of injuries could not be easily ascertained because a requirement for diary completion is in itself a form of intervention and recollection is not considered reliable for minor injuries.

**DISCUSSION**

Several intervention programmes of variable design and objectives have been undertaken in the context of injury prevention.$^{5–7,12–18}$ Although success has been claimed in a number of instances the results were usually modest and occasionally disappointing.$^{6,7,13,19–22}$ We have undertaken the present study with reasonable...
expectation of success because the incidence of injuries is high in Greece,\textsuperscript{2} thus enabling a substantial intervention-mediated reduction. Furthermore, we have used a generally recommended personalized approach in the midst of a community campaign supported by a well-functioning local safety alliance and the target population was well circumscribed and of manageable size.\textsuperscript{18,21,23,24} The evaluation of the programme was intended to meet current standards by involving both process and outcome criteria and by assuring through distinct geographical separation that there was no diffusion of explicit messages from the intervention to control households.

This study was implemented with close adherence to the protocol and the investigators were well received by the people on both islands. Of the 28 process variables, 11 have shown statistically significant improvement in the intervention population of Naxos compared with only one in the comparison population of Spetses. Moreover, the changes in the outcome criterion i.e. incidence of injuries, were all in the expected direction. Overall, after the intervention the incidence was lower in Naxos than in Spetses; the decline was exclusively accounted for by the corresponding decline in the target age groups, namely the young and the elderly; lastly, the decline was more evident with respect to home accidents that represented the principal focus of the intervention. Nevertheless, the results cannot be considered as entirely satisfactory, since the personalized intervention accompanied by a community campaign did not accomplish the expected reduction in the incidence of injuries and none of the related outcome criteria reached statistical significance.

There are four possible explanations for the rather modest success of the intervention. First, it is possible that the incidence of injuries has also declined in

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<th>Spetses</th>
<th>Comparison</th>
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<tr>
<td>0–18 years</td>
<td>Total accidents</td>
<td>Total person-days</td>
<td>Incidence rates (IR) per 10\textsuperscript{5} person-days and rate ratios (RR) with associated 90% confidence intervals (90% CI) and P-values, for total accidents among target and non target age groups in the islands of Naxos and Spetses</td>
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<td>&gt;65 years</td>
<td>Total</td>
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* adjusted (Oleinick & Mantel 1970).\textsuperscript{11}
Spetses because the study sample was monitored and the research assistants in the island, although not specifically trained, were instructed, in line with the protocol, to provide guidance and advice for ethical reasons. Second, the comparison between Naxos and Spetses is essentially ecological and as such it is subject to unidentifiable confounding influences. Third, injuries may be more strongly affected by structural variables that could not be modified or by unpredictable events and conditions that could not be adequately captured in the intervention programme. Fourth, our intervention, however personalized and broadly based, may have not been sufficiently prolonged and intensive to reverse lifelong influences and a risk-prone lifestyle.

The sharp ecological contrast between Scandinavian and other European countries with respect to injury occurrence and mortality, the collective epidemiological evidence and the results of several intervention studies, indicate that injuries represent failure of a complex and intricate balance that does not allow effective compartmentalization and sectoral differentiation. The present intervention adopted an approach with a broad awareness raising campaign involving community leaders and a focused intervention with weekly visits to 172 households; home visits allowed close observation of changes in home safety over the intervention period and keeping of a detailed diary of injury events in order to minimize recall bias. Nevertheless, the results of the study suggest that concentration on specific households combined with sensitization of the whole community is helpful but far from sufficient for effective injury control. The meagre success of small-scale intervention projects, including this one, contrasts sharply with the remarkable accomplishments of Nordic countries that have adopted large-scale, long-term nationwide strategies. It appears that injury prevention requires intensive efforts at several levels that go beyond the capacity of individual public health officers and educators. Although injuries are preventable to a very large extent, preventive intervention efforts should be continuous and should cover a very wide spectrum of activities. As such, injury prevention should be integrated into most aspects of daily life, whereas the role of inattention, which is frequently equated with chance, should be minimized through policies that stress passive rather than active safety, at least for the most vulnerable age groups.

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REFERENCES


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